(12) UK Patent Application (19) GB (11) 2 288 243 (13) A

(43) Date of A Publication 11.10.1995

(21) Application No 9507266.6

(22) Date of Filing 07.04.1995

(30) Priority Data
(31) 9406863 (32) 07.04.1994 (33) GB

(71) Applicant(s)
IMS Innovation Limited

(Incorporated in the United Kingdom)

Unit 2, Fairykirk Road, ROSYTH, Fife, KY11 2QQ, United Kingdom

(72) Inventor(s)
Neil James Hunter

(74) Agent and/or Address for Service
Frank B Dehn & Co
Imperial House, 15-19 Kingsway, LONDON, WC2B 6UZ, United Kingdom

(51) INT CL[6]
G01G 23/01

(52) UK CL (Edition N)
G1N NAHAD N1B3 N3S2 N4B N4D N7H1
U1S S2268

(56) Documents Cited
GB 2175697 A EP 0631118 A1 EP 0131461 A2
US 4512429 A

(58) Field of Search
UK CL (Edition N) G1N NACF NAHAA NAHAD NAHR
INT CL[6] G01G 23/01
Online : wpi

(54) Weighing Apparatus

(57) An electronic weighing apparatus e.g. for items to be posted comprises means for effecting one of a plurality of predetermined gravitational calibration settings in accordance with corresponding predetermined geographical locations, and means enabling a user to input to the apparatus information identifying the location in which the apparatus is employed, whereby the correct calibration setting is effected. As described the calibration settings are in the form of a set of multipliers stored in a look-up table. The selection may be made by scrolling through a list of city codes or by means of a keyboard provided with an overlay in the form of a map.

GB 2 288 243 A

FIG. 1

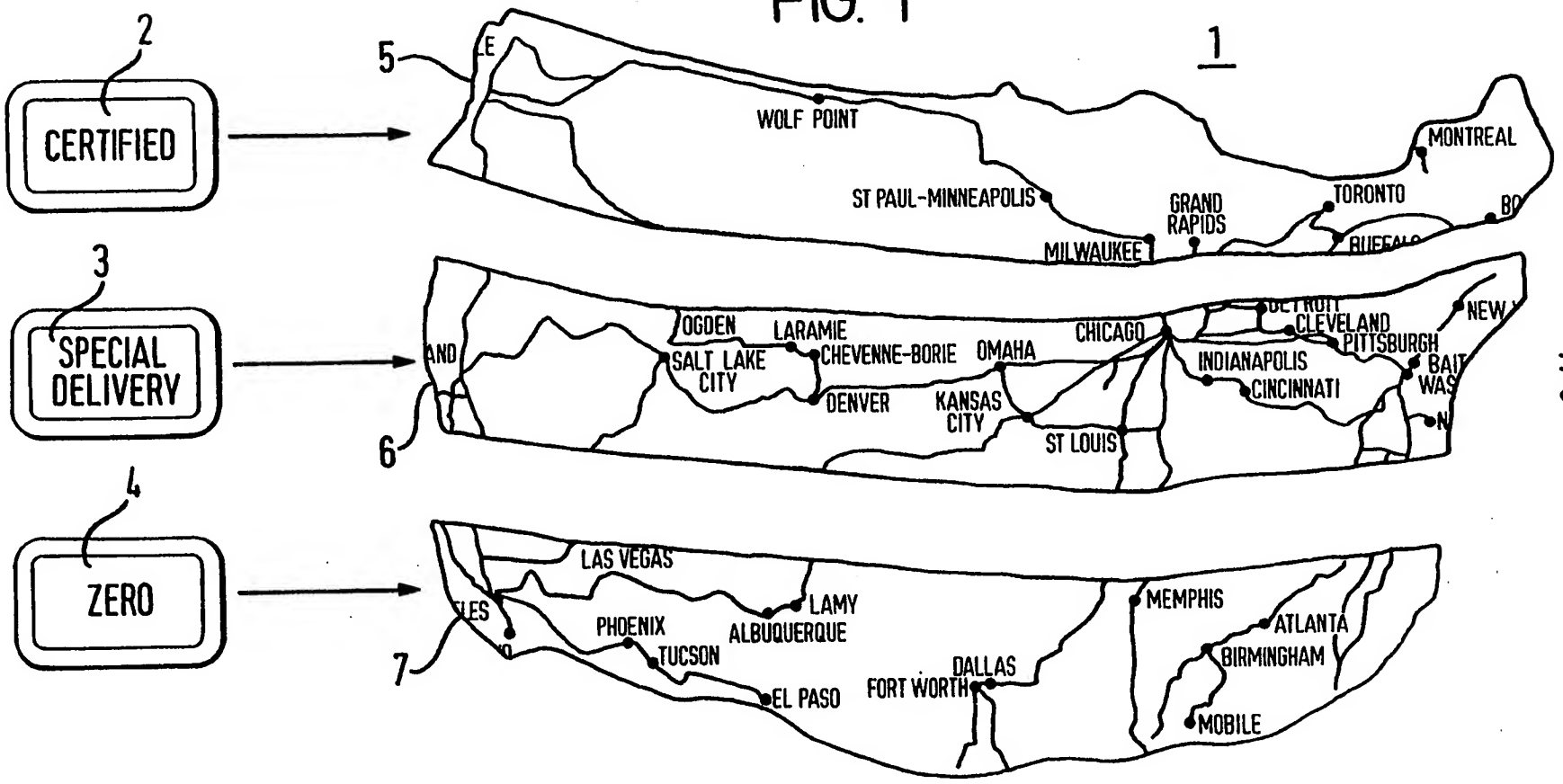
2
CERTIFIED
3
SPECIAL DELIVERY
4
ZERO
5
1
6
7
WOLF POINT
ST PAUL-MINNEAPOLIS
MILWAUKEE
GRAND RAPIDS
TORONTO
MONTREAL
OGDEN
LARAMIE
SALT LAKE CITY
CHEVENNE-BORIE
DENVER
OMAHA
KANSAS CITY
CHICAGO
ST LOUIS
CLEVELAND
PITTSBURGH
INDIANAPOLIS
CINCINNATI
LAS VEGAS
PHOENIX
TUCSON
ALBUQUERQUE
LAMY
EL PASO
DALLAS
FORT WORTH
MEMPHIS
ATLANTA
BIRMINGHAM
MOBILE

FIG. 2

PLEASE STUDY THE LIST OF CITIES BELOW AND CHOOSE THE ONE NEAREST YOU. THIS WILL GIVE YOU A GRAVITATIONAL CORRECTION CODE TO BE ENTERED AS SHOWN OVERLEAF.

USA

CITY	CODE
ATLANTA	6[X][X]
ALBUQUERQUE	6
BALTIMORE	4
CINCINNATI	4

10 11

CITY	CODE

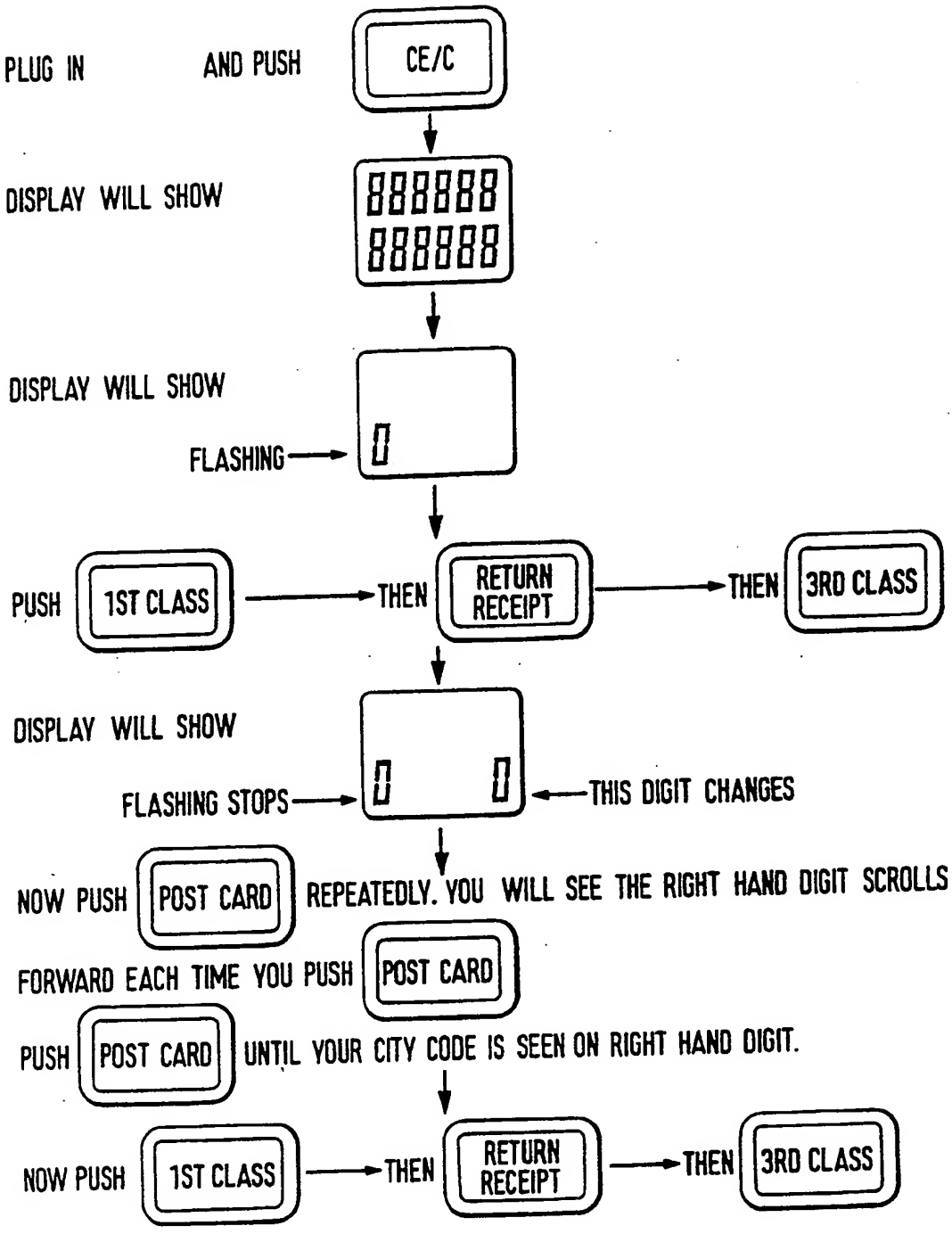
PLUG IN
AND PUSH
CE/C
DISPLAY WILL SHOW
DISPLAY WILL SHOW
FLASHING
0
PUSH
1ST CLASS
THEN
RETURN RECEIPT
THEN
3RD CLASS
DISPLAY WILL SHOW
FLASHING STOPS
0
0
THIS DIGIT CHANGES
NOW PUSH
POST CARD
REPEATEDLY. YOU WILL SEE THE RIGHT HAND DIGIT SCROLLS
FORWARD EACH TIME YOU PUSH
POST CARD
PUSH
POST CARD
UNTIL YOUR CITY CODE IS SEEN ON RIGHT HAND DIGIT.
NOW PUSH
1ST CLASS
THEN
RETURN RECEIPT
THEN
3RD CLASS

FIG.3

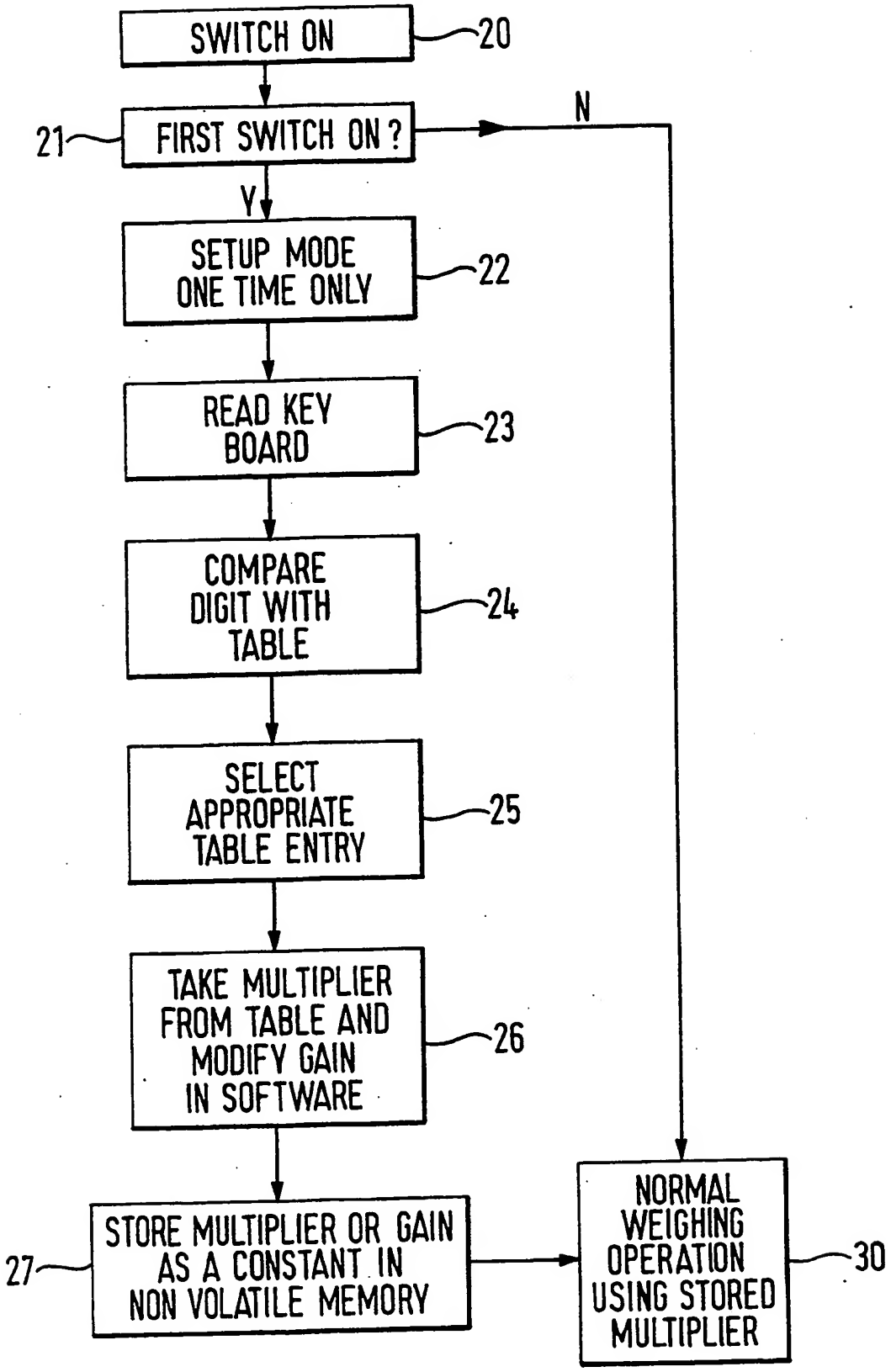
SWITCH ON
20
21
FIRST SWITCH ON ?
N
Y
SETUP MODE ONE TIME ONLY
22
READ KEY BOARD
23
COMPARE DIGIT WITH TABLE
24
SELECT APPROPRIATE TABLE ENTRY
25
TAKE MULTIPLIER FROM TABLE AND MODIFY GAIN IN SOFTWARE
26
27
STORE MULTIPLIER OR GAIN AS A CONSTANT IN NON VOLATILE MEMORY
NORMAL WEIGHING OPERATION USING STORED MULTIPLIER
30

FIG. 4

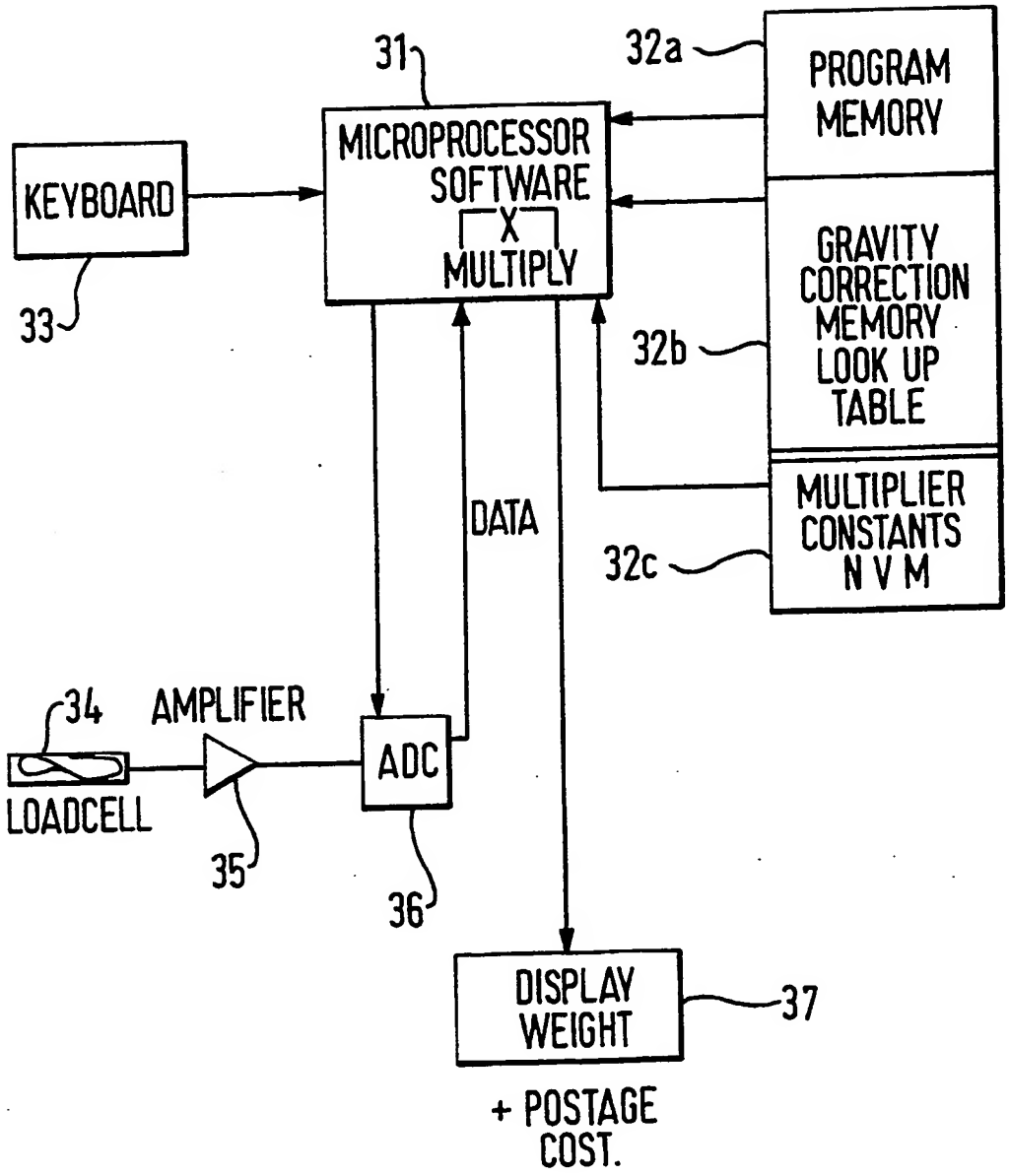
31
32a
PROGRAM MEMORY
MICROPROCESSOR SOFTWARE
X
MULTIPLY
KEYBOARD
33
GRAVITY CORRECTION MEMORY LOOK UP TABLE
32b
MULTIPLIER CONSTANTS N V M
32c
DATA
34
AMPLIFIER
ADC
LOADCELL
35
36
DISPLAY WEIGHT
37
+ POSTAGE COST.

FIG. 5

60845/001.582

WEIGHING APPARATUS

This invention relates to electronic weighing apparatus of all types but is particularly applicable to postal scales and cash counting scales.

Accurate weighing scales require small calibration adjustments as a result of the variable effect of the Earth's gravity which changes dependent on geographic position and other effects. Normally this adjustment is made by a calibration of the weighing machine by a service technician at the location where the machine is used or, alternatively, making an allowance for the change in gravity anticipated at the machines' final destination.

Although this arrangement works effectively, it does have significant drawbacks. The need for a service technician increases the expense involved in commissioning the apparatus, and may also be inconvenient and lead to delays. If the apparatus is calibrated before dispatch, then this leads to greater production costs and to logistical problems since it is then necessary to ensure that specified machines reach the correct destination.

According to the invention there is provided electronic weighing apparatus comprising means for effecting one of a plurality of predetermined gravitational calibration settings in accordance with corresponding predetermined geographical locations, and means enabling a user to input to the apparatus information identifying the location in which the apparatus is employed, whereby the correct calibration setting is effected.

Thus, the requirement for the manufacturer or supplier of the weighing scale to provide a technician to make a local calibration or to make an anticipatory

calibration at the factory is avoided. Consequently there is a significant cost saving since there is no requirement for calibration adjustment by an expensive service technician as discussed above prior to use. It also results in ease of logistics since if a preadjustment calibration were made in the manufacturing facility a track would have to be kept of the serial numbers of each batch of apparatus having each type of setting in order to ensure that appropriately adjusted apparatus were sent to any given location.

Preferably the apparatus is arranged such that it will not operate to weigh articles until the selection process has been completed. This reduces the risk of the apparatus being used with an incorrect setting.

Although it is possible for the apparats to be re-callibrated each time it is switched on, which could be useful if it were frequently to be moved long distances between uses, in most applications the apparatus will always be used at the same site. Therefore, preferably the apparatus is arranged such that the means for enabling a user to input location-identifying information is only enabled when it is first used. This may be achieved, for example by detecting the first time the machine is switched on, or by checking each time the machine is switched on whether calibration settings have already been made. Provision may be made for the apparatus to be re-callibrated after its first use, if required, for example because of the device being used at a new location. Preferably, this function can only be effected by opening the device, for example by a service technician, in order to prevent inadvertent changes in calibration.

The means for enabling the geographical location to be input may take one of a number of forms. It may for example comprise a display such as an overlay of, eg. paper, affixed to a keyboard of the weighing apparatus. Such an overlay could indicate a map of the country

divided into calibration zones with a keyboard button being provided for each zone projecting through or adjacent to the overlay. For example, in the case of the United States, a map would be split into between three and ten sectors dependent upon the accuracy of the weighing required. Alternatively, the whole world could be depicted as a map with latitude bands and each band would represent a different calibration setting. The overlay could be permanently affixed to the keyboard, but since the calibration information will only normally be used once, the overlay is preferably removable. This allows the keys or buttons to be used for other functions during the operation of the machine without requiring the confusing presence of a multiplicity of labels for each key or button.

Alternatively there may be a list of postal or ZIP codes with an appropriate key allocated against each. The list may also be provided on a preferably removable overlay and may be arranged such that the postal/zip code for a given location is adjacent the appropriate key. Alternatively, the list may be provided separately, for example in an instruction manual and may provide an indication of which key or key sequence should be used to indicate the location of the apparatus.

Another alternative would be to use the display on the weighing scale to indicate zones or areas with a cross reference against a list of cities. The display may, in this way, indicate which key(s) should be used to indicate the location of the apparatus, or the arrangement may be that the user scrolls through the list until the desired zone or area is displayed.

Preferably, means to prevent errors in data entry would be provided. This could take the form of an additional sequence of button presses to ensure the user repeats or verifies that the data is correct before it is finally entered into non volatile memory.

A convenient way to implement the invention is for the apparatus to be provided with a look-up table provided in memory to give the correction factor in response to a given button push. This factor may then be used to modify a constant stored in memory which, either directly or indirectly, relates an electronic signal produced by a weight transducer in the weighing apparatus to the weight of an item which is being weighed. (The weight may be determined in eg. metric or imperial units, for direct display, or as a parameter used by the apparatus on the basis of which further data, such as the cost of posting the item may be determined).

Certain embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic view of an overlay in position over the keyboard of a weighing apparatus according to a first embodiment;

Fig. 2 is an instruction set including cross reference between a list of cities and corresponding calibration codes of a second embodiment;

Fig. 3 is a flow chart illustrating the mode of use of an apparatus according to the second embodiment;

Fig. 4 is a flow chart illustrating the entry of a calibration setting into both embodiments of the invention;

Figure 5 is a block diagram schematically illustrating the main components of both embodiments of the invention.

Turning first to Figure 1 there is illustrated schematically an overlay 1 which may be positioned over a keyboard having buttons 2, 3 and 4 of an electronic weighing apparatus. The overlay is provided with a map of, in this case, the United States of America divided into three calibration zones 5, 6 and 7. Each of these zones corresponds to buttons 2, 3 and 4 respectively.

Before the apparatus may be used for the first time, one of the buttons must be pressed in order to choose the correct gravitational calibration setting for the zone in which the machine is to be used. In order to ensure that the wrong button is not pressed accidentally, it is necessary to press the appropriate button four times. Following this, the apparatus reverts to the usual weighing mode. The overlay may be removed from the keyboard and the buttons 2, 3 and 4 may be used for other purposes.

As an alternative to the above system, in a second embodiment the apparatus is supplied with a list of cities 10, followed by a series of corresponding codes 11. Before the apparatus may be used, for the first time it must be calibrated according to the flow chart of Figure 3. Thus, after certain initial button presses as illustrated in the flow chart, the appropriate code 11 is entered into the machine. This is done by scrolling through the list of possible codes until the desired one is reached. Further button presses set this code in memory and the subsequent operation of the weighing apparatus uses a gravitational calibration value obtained from a look-up table stored in memory which corresponds to the code selected.

Figure 4 illustrates the calibration of an apparatus by means of a flow chart. Starting from box 20, the switch-on of the machine is detected and the calibration sequence is started. Then, at decision box 21, if the machine is being switched on for the second or subsequent time (ie. it is already callibrated), then no calibration is required and the apparatus may be used immediately (box 30). However, if no calibration has been made, then the apparatus proceeds in set-up mode (box 22). The keyboard is read (box 23) until a suitable input is made. Then, the input is compared with values stored in a look-up table (box 24). When the currect value is found, the corresponding

calibration factor "multiplier" is taken from the table (box 25). This is then used to modify the "gain" constant used by the machine's software to translate the signal from a weight transducer (eg. a loadcell) into useful data (box 26). The resulting modified gain constant is then stored in non-volatile memory (box 27). Subsequently, the apparatus may be operated in the conventional manner (box 30).

The main components of the apparatus are shown in block-diagram form in Figure 5. The operation of the apparatus is controlled by microprocessor 31 which runs a program stored in Program Memory 32a. The microprocessor reads the keyboard and when a calibration input is made, accesses a look-up table stored in memory 32b. This provides the gain constant which is stored in non volatile memory 32c.

Subsequently, when the apparatus is used, loadcell 34 provides an analogue signal which is amplified by amplifier 35 before being fed to Analog to Digital Convertor 36. The microprocessor 31 then multiplies the resulting digital data by the gain constant stored in memory 32c, and the resultant weight value is displayed by display 37. If required, further calculation steps may be performed by the microprocessor, eg. to provide a display in terms of postage cost.

Claims

1. An electronic weighing apparatus comprising means for effecting one of a plurality of predetermined gravitational calibration settings in accordance with corresponding predetermined geographical locations, and means enabling a user to input to the apparatus information identifying the location in which the apparatus is employed, whereby the correct calibration setting is effected.

2. Apparatus as claimed in claim 1, wherein the apparatus is arranged such that it will not operate to weigh articles until the location identification process has been completed.

3. Apparatus as claimed in claim 1 or 2, wherein the apparatus is arranged such that the means for enabling a user to input location-identifying information is only automatically enabled when the apparatus is first used.

4. Apparatus as claimed in claim 1, 2 or 3 wherein the means for enabling the geographical location to be input comprises a display affixed to a keyboard of the weighing apparatus indicating which of a plurality of keys should be pressed to indicate a given geographical location.

5. Apparatus as claimed in claim 4, wherein the display is removable.

6. Apparatus as claimed in any preceding claim, wherein a look-up table is provided in memory to give a gravitational correction factor in response to a given button push.

7. Apparatus as claimed in claim 6, wherein the correction factor is used to derive a gravitational calibration constant which is stored in non-volatile memory.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9507266.6
Relevant Technical Fields (i) UK Cl (Ed.N) G1N (NACF, NAHAA, NAHAD, NAHR) (ii) Int Cl (Ed.6) G01G 23/01	Search Examiner M G CLARKE Date of completion of Search 29 JUNE 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI	Documents considered relevant following a search in respect of Claims :- 1 TO 7

Categories of documents

X:	Document indicating lack of novelty or of inventive step.	P:	Document published on or after the declared priority date but before the filing date of the present application.
Y:	Document indicating lack of inventive step if combined with one or more other documents of the same category.	E:	Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A:	Document indicating technological background and/or state of the art.	&:	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2175697 A	(MPI) whole document	1, 6 at least
X,P	EP 0631118 A1	(METTLER-TOLEDO) see especially Claims 1 and 4	1
X	EP 0131461 A2	(K K ISHIDA KOKI) see especially page 27 line 22 to page 30 line 21	1, 6 at least
X	US 4512429	(ASS TO METTLER INSTRUMENTS) whole document	1, 6 at least

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).